



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/697,305	10/31/2003	Yoon Jik Lee	0763-0338P	9883
2292	7590	09/22/2004	EXAMINER	
BIRCH STEWART KOLASCH & BIRCH PO BOX 747 FALLS CHURCH, VA 22040-0747			PHAM, THANHHA S	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 09/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/697,305	Applicant(s) LEE ET AL.	
	Examiner Thanhha Pham	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 10/166,685.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>10/31/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Oath/Declaration

1. Oath/Declaration filed on 10/31/03 has been considered.

Specification

2. **The disclosure is objected to because of the following informalities:**
 - Specification page 1, lines 2-3 of paragraph [01]: "of pending prior Application No. 10/166,685 filed on June 12, 2002 (now allowed)" should be changed to "of a prior Application No. 10/166,685 filed on June 12, 2002 which is now Patent No. 6,667,228".
 - Specification page 11, line 11 of paragraph [31]: "the second insulating interlayer 24" should be changed to "the second insulating interlayer 26".
 - Specification page 12, line 14 of paragraph [31], "the second insulating interlayer 24" should be changed to "the second insulating interlayer 26".Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

Art Unit: 2813

applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**3. Claims 1-2 and 4-8 are rejected under 35 U.S.C. 102(e) as being anticipated
Tanaka [US 6,369,446].**

➤ With respect to claim 1, Tanaka (figure 4C and col. 8-9 & 10-11) discloses the claimed semiconductor device comprising:

a first insulating interlayer (7, col. 8 lines 33-37) on a semiconductor substrate (0, col. 8 lines 33-37);

a first cell plug (10, col. 8 lines 55-65) on the semiconductor substrate (0) through the first insulating interlayer (7);

a second insulating interlayer (11, col. 9 lines 14-24) on the first insulating interlayer (10);

a silicide contact (18, col. 11 lines 23-29) on a predetermined surface of the first cell plug (10) through the first insulating interlayer (7);

a second cell plug (17, col. 11 lines 30-43) on the silicide contact (18) through the second insulating interlayer (11).

➤ With respect to claim 2, Tanaka (col. 11 lines 30-36) discloses that the second cell plug is formed of metallic material with low resistance .

➤ With respect to claims 4-5, Tanaka (col. 8 lines 56-65) discloses that the first cell plug is formed of a polysilicon film.

➤ With respect to claims 6-7, Tanaka (col. 10 lines 64 and col. 11 lines 18-29) discloses that the silicide contact (18) is formed by using a metal film of titanium (Ti).

Art Unit: 2813

- With respect to claim 8, Tanaka (figure 4C) discloses that the silicide contact (18) is formed directly on the first cell plug (10) through the first insulating interlayer (7).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 3 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka [US 6,369,446] in view of Summerfelt et al.[US 6,593,638].

- With respect to claim 3, Tanaka substantially discloses the claimed semiconductor device wherein the second cell plug (17) is formed of the metallic material with low resistance (see Tanaka, col. 11 lines 30-35). Tanaka fails to disclose the metallic material is a titanium nitride film. Instead, the metallic material of Tanaka is a tungsten, aluminum or copper film.

However, Summerfelt et al. (figure 10, col. 6) teaches that titanium nitride is an equivalent material to tungsten, aluminum or copper for forming the conductive plug (46).

Therefore, at the time of invention, it would have been obvious for those skilled in the art to substitute titanium nitride for tungsten, aluminum or copper in the second cell plug of Tanaka because of their equivalences for their use in semiconductor art as a conductive plug material and the selection of any of these known equivalences to be

Art Unit: 2813

used as a conductive plug material would be within the level of ordinary skill in the art, as taught by Summerfelt et al. (col.6 lines 43-50).

➤ With respect to claim 9, it would have been obvious for those skilled in the art to recognize that the titanium nitride film of the second cell plug would function as a barrier metal layer because titanium nitride is a known refractory metal which has a property as a diffusion barrier (see Tanaka, col.10 lines 64-67 and col. 11 lines 54-56).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (571) 272-1696. The examiner can normally be reached on Monday and Thursday 9:00AM - 9:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Thanhha Pham
Patent Examiner
Patent Examining Group 2800